

## **A Logical Bias Could Be Keeping Us From Noticing South India Groundwater Crisis**

Sagnik Ghosh  
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During World War II (1939-1945), pilots were interested in ways to make their fighter jets more resistant to getting shot. To this end, the Allied forces at least would inspect jets that returned from sorties and check where the bullet holes were. Then they would reinforce those areas and send the planes back.

Fortunately for them, a statistician realised that this ad hoc solution wouldn't improve the plane's chances very much: the location of the bullet holes were actually where the planes could take a

hit and still not go down. So he directed the air force to reinforce parts of the planes that hadn't yet been hit.

The intuitive urge to make decisions about survival based on what has survived is called survival bias.

Something similar could've been happening to our understanding of groundwater levels in South India. Several papers published recently claimed that groundwater levels have been on the rise and had the data to show for it. They used government records on groundwater levels in wells together with data from a NASA satellite called GRACE, which can deduce underground water content using the water's minute gravitational effects.

Also read: [Tom and Jerry Set to Map Water on Earth From Space](#)

But Nandita Basu, who studies water resource sustainability at the University of Waterloo, Canada, and her peers realised the data might have been skewed by survival bias. That is, the papers reporting high groundwater levels could've left out wells that had dried up, leaving the water-level records incomplete.

"If you're looking at the surviving groundwater wells, then like the surviving planes, you're biasing in an area that isn't giving you the full picture," Basu told The Wire.

"We felt something was fishy here because [claims of groundwater levels rising] were not at all consistent with what we were seeing in the field," Veena Srinivasan, who leads the water, land and society programme at the Ashoka Trust for Research in Ecology and the Environment (ATREE), Bengaluru, said. "The minute you go out to the agricultural areas, you see big issues with groundwater decline."

"This is actually a persistent problem," Basu said apropos the missing data and that previous studies ignored it. "It is true everywhere in the world, especially where wells are drying up."

Scientists analysing the data from their offices pointed one way while people living in these areas pointed the other. The answer to this paradox lies quite literally beneath our feet. The ground in South India is markedly different from that in other parts of India. Basu and her team realised that methods of analysing water level that work with the rich alluvial soil in the country's north won't work in the hard rocky terrain of the south. Alluvial soil allows water to flow more uniformly through it than hard rock systems, where water can only flow through cracks. This can lead to one well with a hundred feet of water and another just a few meters away with no water.

The research team wanted to figure out whether the records were incomplete because the wells had dried up or simply because wells had been neglected. "We looked for a pattern in the missing data," Tejasvi Hora, the lead researcher of the study and a PhD student at the University of Waterloo, said.

They found that in drier years there were more wells with missing data. The number of such wells was also higher in places that had more groundwater irrigation.

This correlation between missing data and drier conditions meant that there was a good chance that most wells with missing data had dried up.

“When you see missing data, it is missing for a reason, and that reason might be a disappearing well. So don’t ignore it,” Basu said.

This connection led Hora and his colleagues to a solution: “It was this ‘drying up’ that was an inspiration [for us] to look at the data in a different way.”

They realised that dry and defunct wells provide a much better measure of groundwater sustainability. This is news for everyone because while other studies explored trends in groundwater levels, no study has thus far explored trends monitoring wells.

And the new study’s results are not encouraging, so things need to change – fast. “The first thing is to recognise that groundwater stress exists in South India,” Hora said. “Not just little pockets – it’s pretty widespread.”

Also read: [Northeast Monsoon Flops, Triggering Drought-Like Conditions Across South India](#)

While this widespread stress affects the entire population, it is harder on average on the farmers whose livelihoods depend on it. “Their wells are running dry and they’re being forced to dig deeper and deeper wells,” Basu said. “This work brings recognition to that fact at a much larger scale and it allows us to say that these are not stray events; it’s pretty ubiquitous and we need to pay attention to it.”

T.V. Ramachandra, a noted expert on terrestrial and aquatic ecosystems at the Centre for Ecological Sciences at the Indian Institute of Science, Bengaluru, agrees scientists can interpret the data and that things may not be as rosy they seem to be. “Because of poor regulatory mechanisms we are paying the price, our farmers are paying the price,” he said.

The fact that this work could draw attention to an important issue in his home country was a big motivating factor for Hora. “I was pretty naïve. I thought that having moved out, I was lucky. Maybe I had privilege growing up in Mumbai, so I wondered if I could help now... And it all kind of worked out that way.”

Their [peer-reviewed paper](#) was published in August 2019.

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